

A NEW SUBGENUS AND SPECIES OF CRAYFISH
(DECAPODA: CAMBARIDAE) OF THE GENUS
CAMBARUS, WITH AN AMENDED
DESCRIPTION OF THE SUBGENUS
LACUNICAMBARUS

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Abstract.—A new subgenus of crayfish, *Tubericambarus*, and a new species, *Cambarus (Tubericambarus) thomai*, are described. The new species is most closely related to *C. (T.) acanthura*, new combination, but differs from it in that the distomedian spine on the mesial ramus of the uropod does not overreach the rounded margin of the ramus, and the merus always has a well developed spiniform tubercle on the distroventral articular rim. The species occurs in Kentucky, Ohio, Pennsylvania, Tennessee, and West Virginia. The definition of the subgenus *Lacunicambarus* is amended and distributional maps of the subgenera are included.

As early as 1885, Faxon (p. 72) noted that what is currently called *Cambarus (Lacunicambarus) diogenes* is a species complex consisting of at least three forms: an eastern form found on the Atlantic Coastal Plain, a western form extending from the western side of the Appalachian Mountains westward to the eastern slopes of the Rocky Mountains and from the Gulf Coast northward to southern Canada, and a variety designated by him as *Cambarus Diogenes* var. *Ludovicianus*, from the environs of New Orleans, Louisiana. Faxon's variety was later elevated to subspecific rank by Hay (1899: 959). Marlow (1960:248) attempted to clarify the taxonomy of this group, but his major contribution was providing further evidence for recognizing *C. d. ludovicianus* as a valid subspecies. In 1969, Hobbs revised the genus *Cambarus* by dividing it into 10 subgenera, provided diagnoses for the subgenera, and listed the species belonging to each of them. *Cambarus diogenes* and related forms were placed in the subgenus *Lacunicambarus*. Two additional taxa of the complex were described, *C. (L.) miltus* Fitz-

patrick, 1978, and *C. (L.) acanthura* Hobbs, 1981. In 1989, Hobbs (p. 26) raised *C. (L.) d. ludovicianus* to specific rank and repeated the statement he made in 1974 (p. 20) that "This [the *C. (L.) diogenes* group] is a species complex that needs considerable attention."

After studying the complex for the last 12 years, I have concluded that the complex consists of two subgenera *Lacunicambarus* and *Tubericambarus*, new subgenus, and at least five additional species or subspecies. The subgenus *Lacunicambarus* is amended, the new subgenus is defined, and one new species is described herein.

Lacunicambarus Hobbs, 1969, amended

Diagnosis.—Eyes reduced and pigmented. Antennae not heavily fringed on mesial border. Rostrum with margins moderately thickened, usually without spines or tubercles. Postorbital and cervical spines absent. Suborbital angle prominent and often acute to subacute. Branchiostegal spine reduced to small tubercle or absent. Areola oblit-

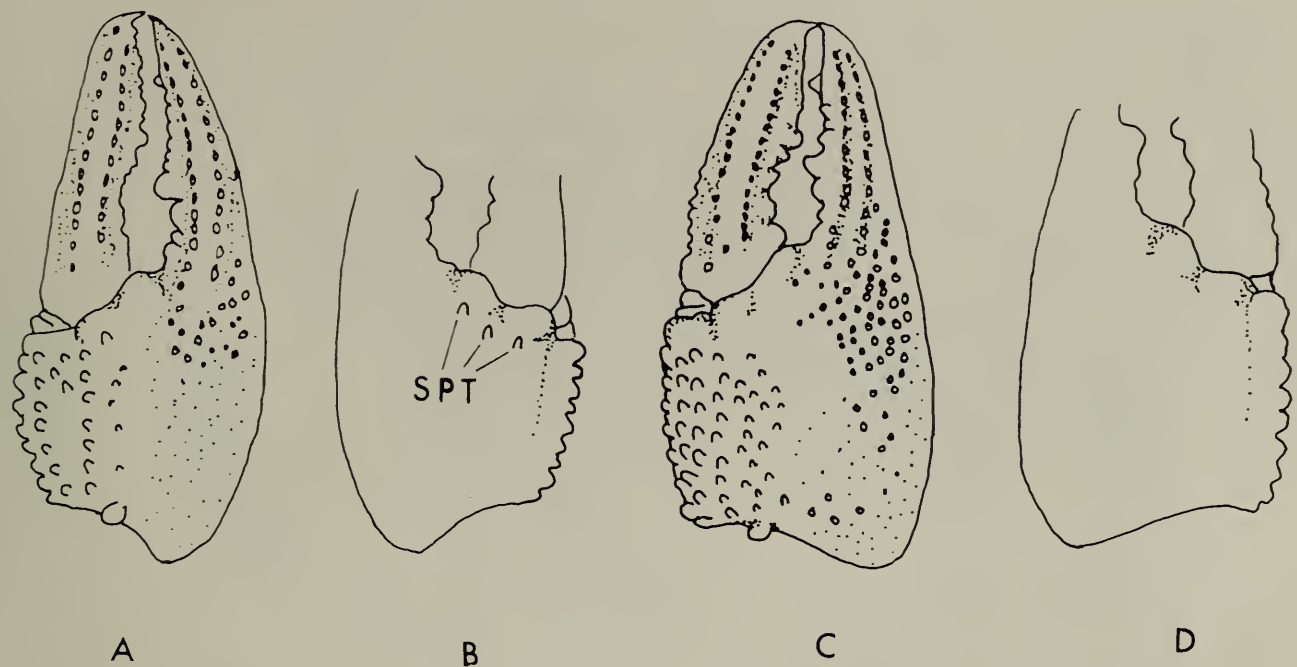


Fig. 1. *Cambarus (Lacunicambarus) diogenes*: A, dorsal view right chela; B, ventral view right chela, (SPT = 3 subpalmar tubercles). *Cambarus (Tubicambarus) acanthura*: C, dorsal view right chela; D, ventral view right chela.

erated or linear along much of its length, constituting 37–45% (\bar{X} = 42%) of total length of carapace, never bearing more than 2 punctations in narrowest part. Chela (Fig. 1A) moderately robust with dactyl length/palm length ratio greater than 1.9 on first form males; dorsomesial surface of palm of chela with 2 well developed rows of tubercles usually numbering 6–8 each, third row running to knob at base of the dactyl, and additional scattered tubercles present between second and third rows; dorsomesial surface mostly punctate laterally; lateral margin of fixed finger of chela subcostate, with punctations but never bearing row of spines; fingers gaping and with moderately well defined dorsomedian longitudinal ridges; proximal opposable margin of dactyl distinctly concave; inconspicuous tuft of setae sometimes present at mesial base of fixed fingers, dorsolateral base slightly impressed; subpalmar tubercles (Fig. 1B) 1–3. Medial spine on mesial ramus of uropod never overreaching caudal margin of ramus. Form I male with coxa of fourth pereopod lacking large ventral setiferous pit on caudomesial

boss; first pleopods contiguous at base, distal portion of shaft straight; terminal elements consisting of (1) short, broad, blade-like, distally truncate or rounded central projection (rarely with subapical notch) recurved at about 90° to shaft, (2) swollen mesial process variously shaped and directed, and frequently bearing 1–4 small tuberculiform prominences apically, and (3) often rudimentary caudal knob at caudo-lateral base of central projection.

Females with annulus ventralis subsymmetrical, slightly movable; first pleopod present and reaching cephalically beyond caudal margin of annulus.

Type species.—*Cambarus (Lacunicambarus) diogenes* Girard, 1852:88.

Species.—*Cambarus (Lacunicambarus) diogenes* Girard, 1852:88, *C. (Lacunicambarus) ludovicianus* Faxon, 1884:144, and *C. (Lacunicambarus) miltus* Fitzpatrick, 1978:749.

Range.—Disjunct (Fig. 2). Along the Atlantic Coastal Plain from Maryland to Eastern Georgia; from Western Georgia to Eastern Texas, northward from Louisiana to

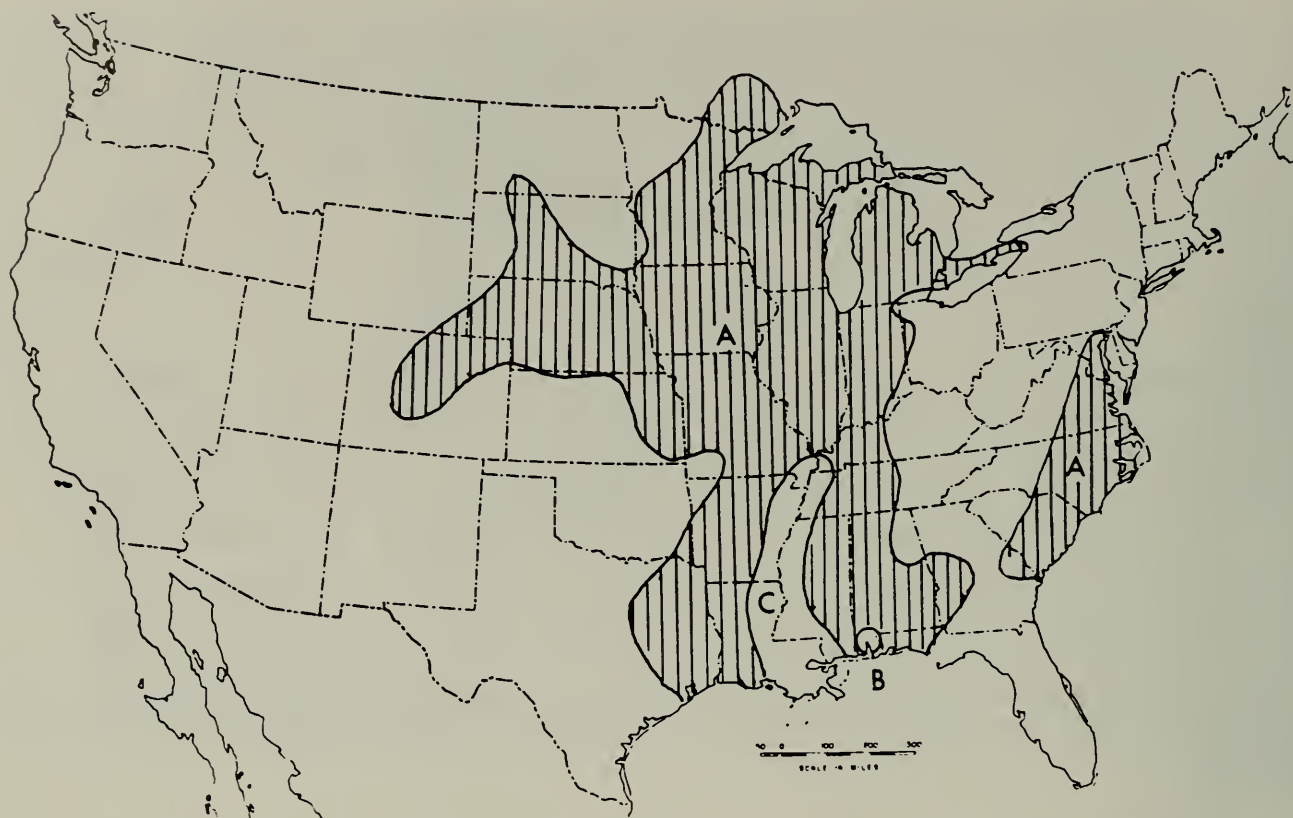


Fig. 2. Geographic range of the subgenera *Lacunicambarus*: A, range of *C. (L.) diogenes*; B, range of *C. (L.) miltus*; C, range of *C. (L.) ludovicianus*.

Canada, as far west as Denver, Colorado, and as far east as western New York via the north shore of Lake Erie.

Tubericambarus, new subgenus

Diagnosis.—Eyes reduced and pigmented. Antennae not heavily fringed on mesial border. Rostrum with margins moderately thickened without spines or tubercles (sometimes present on small juveniles). Postorbital and cervical spines absent. Suborbital angle prominent and often acute to subacute. Branchiostegal spine reduced to small tubercle or usually absent. Areola usually obliterated or linear, and constituting 40–47% ($\bar{X} = 43\%$) of total length of carapace, never bearing more than 1 punctation in narrowest part. Chela (Fig. 1C) moderately robust with dactyl length/palm length ratio less than 1.8 on first form males; mesial $\frac{1}{3}$ to $\frac{1}{4}$ of dorsal palmar surface of chela studded with small tubercles; dorsomesial surface tuberculate, punctate laterally; lat-

eral margin of fixed finger of chela smooth or costate with punctations but never bearing row of spines; fingers slightly gaping with well defined dorsomedian longitudinal ridges; proximal opposable margin of dactyl concave; tufts of setae at mesial base of fixed fingers usually absent, dorsolateral base with moderate impression; subpalmar tubercle (Fig. 1D) usually absent, occasionally 1 present. Median spine on mesial ramus of uropod reaching or overreaching caudal margin of ramus. Form I male with coxa of fourth pereopod lacking large ventral setiferous pit on caudomesial boss; first pleopods contiguous at base, distal portion of shaft straight; terminal elements consisting of (1) short, broad, blade-like, distally rounded central projection (rarely with subapical notch) recurved at about 90° to shaft, (2) swollen mesial process variously shaped and directed, bearing 1 small tuberculiform prominence apically, and (3) lacking caudal knob at caudolateral base of central projection.

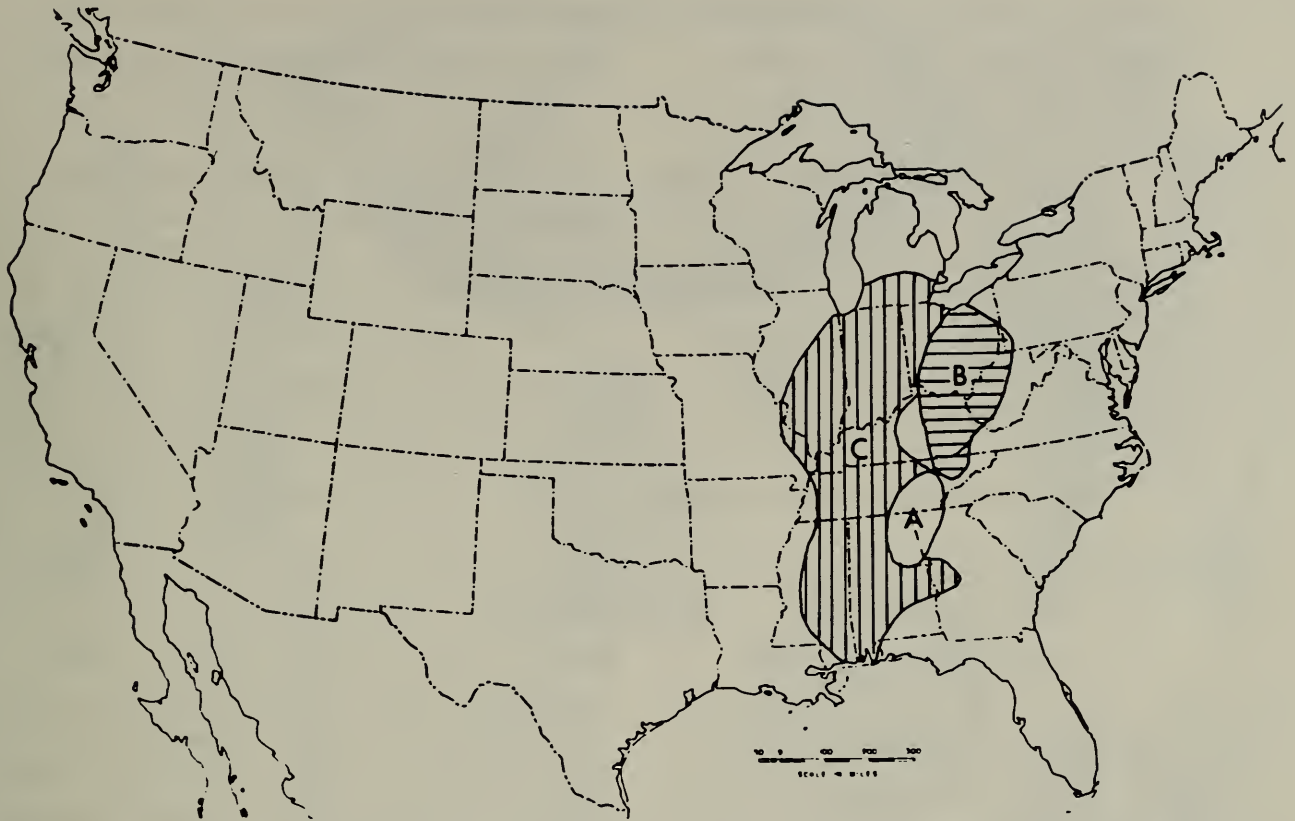


Fig. 3 Geographic range of the subgenus *Tubericambarus*: A, range of *C. (T.) acanthura*; B, range of *C. (T.) thomai*; C, range of *C. (T.)* sp. A.

Females with annulus ventralis subsymmetrical, slightly movable; first pleopod present and reaching cephalically beyond caudal margin of annulus.

Type species. — *Cambarus (Tubericambarus) acanthura* Hobbs, 1981:215, new combination.

Species. — *Cambarus (Tubericambarus) acanthura* Hobbs, 1981:215, and *C. (Tubericambarus) thomai*, new species. *C. (Tubericambarus) sp. A.*

Gender. — Masculine.

Etymology. — *Tuber-* (L. *tuberosus* = full of lumps or protuberances) combined with *Cambarus*, in reference to the tubercles covering a significant portion of the palm of the chela.

Range. — The Gulf Coastal Plain of Florida (Fig. 3), Georgia, and Mississippi northward up the Appalachian Plateau to Lake Erie, Southern Michigan, and west to Central Illinois and Eastern Missouri. Apparently absent in the Blue Grass Region of Kentucky.

Hobbs' (1972:108) taxonomic key should be modified as follows:

- 12(10) Dactyl of chela lacking broad concavity on basal ½ of opposable margin (fig. 90e); first pleopod with central projection distinctly longer than cephalocaudal diameter of shaft at base of projection (fig. 92b–d)
 . . *Depressicambarus* Hobbs, 1969: 112

- Dactyl of chela with broad concavity on basal ½ of opposable margin (fig. 90d); first pleopod with central projection equal in length to, or shorter than, cephalocaudal diameter of shaft at base of projection (fig. 92a) . . 13

- 13(12) Mesial and dorsomesial surface of palm with 2 distinct rows of tubercles, third row extending to knob at base of dactyl, additional tubercles between sec-

ond and third rows; dactyl length greater than 1.9 times palm length; 1–3 subpalmar tubercles usually present

... *Lacunicambarus* Hobbs, 1969: 127

Mesial and dorsomesial $\frac{1}{4}$ to $\frac{1}{3}$ surface of palm studded with small tubercles; dactyl length less than 1.8 times palm length; subpalmar tubercles 1 or usually absent

.. *Tubericambarus*, new subgenus

Cambarus (Tubericambarus) thomai,
new species

Fig. 4, Table 1

Cambarus diogenes Girard, 1852:88 [in part].—Williamson, 1899:48. [in part].—Ortmann, 1905a:398 [in part], 1905b:123 [in part].—Newcombe, 1929:286.—Rhoades, 1944a:146 [in part], 1944b:98 [in part].—Marlow, 1960:231 [in part].

Cambarus diogenes diogenes.—Hay, 1899: 959 [in part].—Marlow, 1960:233.

Cambarus (Bartonius) diogenes.—Ortmann, 1906:402 [western part].—Turner, 1926:168 [in part].

Cambarus (Lacunicambarus) diogenes diogenes.—Hobbs, 1969:110 [in part].—Bouchard, 1972:56 [in part], 1975:595 [in part].—Hobbs, 1974:20; [in part].—Lawton, 1979:47.—Thoma & Jezerinac, 1982: 136.—Jezerinac & Thoma, 1984:123 [eastern form].—Jezerinac 1985:7 [eastern form].

Cambarus (Lacunicambarus) diogenes.—Jezerinac, 1985:7 [eastern].—Jezerinac and Stocker, 1989:2; 1990:8.—Hobbs, 1989:24 [in part].

Cambarus (Lacunicambarus) sp. A.—Jezerinac, 1986:178 (eastern Ohio).

Diagnosis.—Pigmented; eyes slightly reduced. Rostrum usually straight or sometimes gently decurved in lateral view, margins converging, slightly thickened, without marginal spines or tubercles, lacking me-

dian carina, shallowly excavated. Carapace laterally compressed, without cervical spines or tubercles. Branchiostegal tubercles very small or absent. Suborbital angle acute. Postorbital ridges weak, never ending in spines or tubercles. Areola usually obliterated, constituting, in adults, 39.8–42.5% (\bar{X} = 42.3%) of entire length of carapace, and, if open, with room for only 1 row of punctations in narrowest part. Antennal scale 2.5–2.8 times as long as wide, broadest at about midlength. Mesial $\frac{1}{4}$ surface of palm of chela (Fig. 1C) with distinct to adpressed tubercles, mesial row consisting of 6–8. No tufts of elongate setae at base of propodus. Opposable margin of dactyl weakly incised. Ratio of palm length to dactyl length averaging 1.6. Dorsomedian longitudinal ridges strong. Dorsolateral impression at base of propodus moderate to strong. Ventral surface of chela with 1, or usually without, subpalmar tubercle (Fig. 1D). Ventral surface of carpus with spiniform tubercle on distal articular rim. Mesial ramus of uropod with distomedian spine reaching caudal margin, but never extending beyond. First pleopods of form I male contiguous at base, with convexity near midlength of cephalic surface; terminal elements consisting of (1) short, non-tapering, distally truncate central projection, and (2) conically shaped mesial process, both directed caudally at angle slightly greater than 90° . Hooks on ischium of third pereopods only. Female with annulus ventralis elliptical, slightly longer than broad, and rather deeply embedded in sternum.

Holotype male, Form I.—Body subovate (Fig. 4A, J), laterally compressed. Abdomen narrower than cephalothorax (12.5 and 17.7 mm); maximum width of carapace greater than depth at caudodorsal margin of cervical groove (17.7 and 16.8 mm). Areola closed with no punctations in narrowest part; length comprising 43.1% of total length of carapace. Rostrum with convergent, slightly thickened, margins; acumen not distinctly delimited basally, anterior tip upturned and

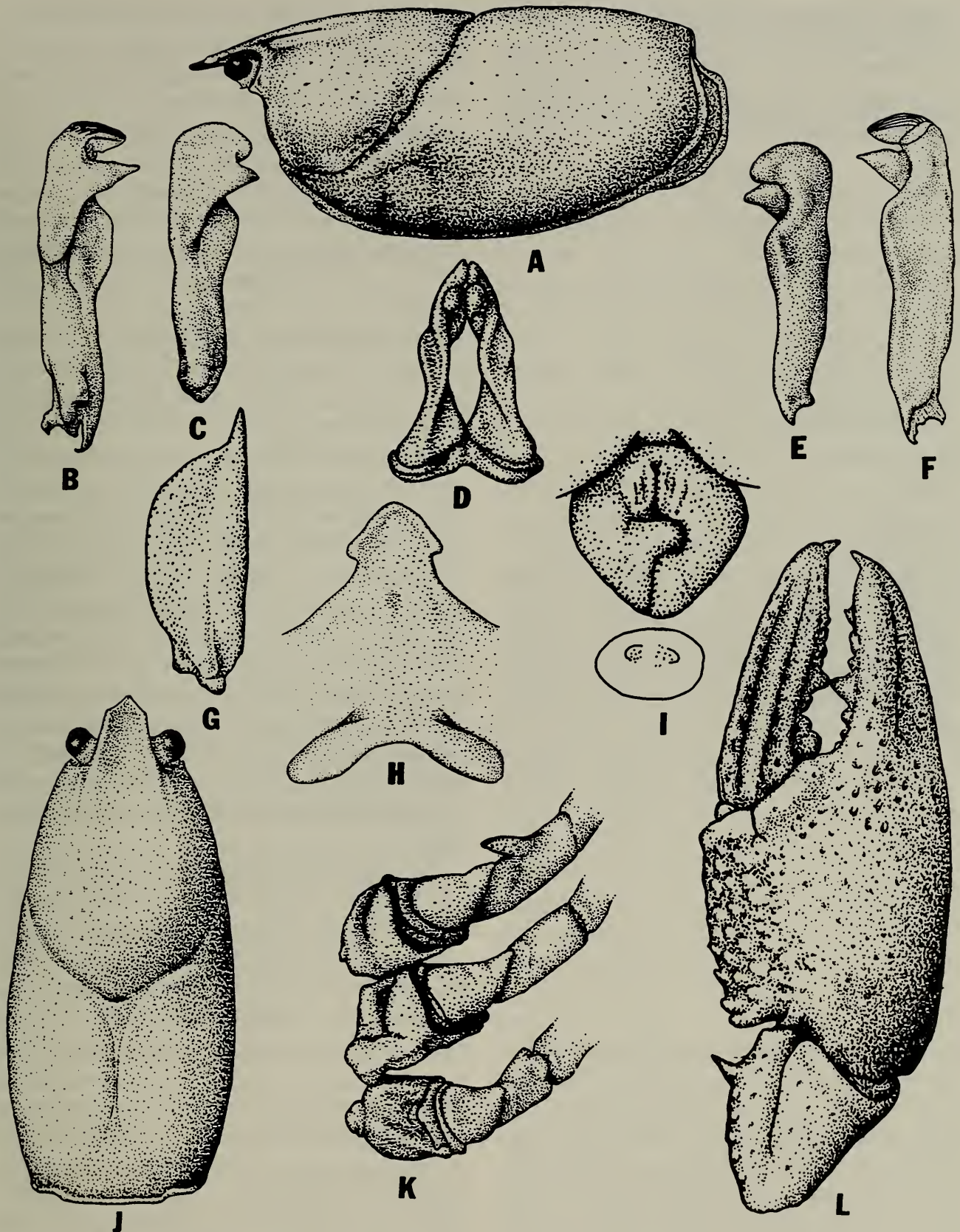


Fig. 4. *Cambarus (Tubericambarus) thomai*, new species. All from holotype male, Form I, except C, E, from morphotype male, form II and I, from allotype female: A, lateral view of carapace; B, C, mesial view of first pleopods; D, caudal view of first pair of pleopods; E, F, lateral view of first pleopod; G, antennal scale; H, epistome; I, annulus ventralis; J, dorsal view of carapace; K, proximal podomeres of third, fourth, and fifth pereopods; L, dorsal view of distal podomeres of cheliped. (See Table 1 for precise measurements.)

Table 1.—Measurements (mm) of *Cambarus (Tubericambarus) thomai*, new species.

Character	Holotype	Allotype	Morpho- type
Carapace			
Height	16.0	17.0	14.6
Width	17.7	17.3	13.9
Length	39.4	40.0	32.2
Areola			
Length	16.8	16.9	13.4
Rostrum			
Width at eyes	4.2	4.2	3.8
Length	7.6	8.4	6.4
Length to anterior postorbital ridges	6.3	6.4	5.2
Postorbital ridge			
Width	7.8	7.2	5.9
Chela—right			
Length of lateral margin of palm	31.1	28.6	22.1
Length of mesial margin of palm	11.6	10.6	7.3
Width of palm	14.5	13.2	10.3
Length of dactyl	18.2	16.9	13.7
Thickness of palm	9.2	8.9	6.5
Abdomen			
Length	40.0	44.3	31.7
Width	12.5	18.1	11.7
Gonopod			
Length	9.6		7.8
Antennal scale			
Length	5.3	5.4	5.0
Width	2.1	1.9	1.8

reaching base of ultimate podomere of antennular peduncle; upper surface of rostrum concave with no punctations other than usual submarginal ones. Subrostral ridge weak but evident in dorsal aspect along basal $\frac{2}{3}$ of rostrum. Postorbital ridge weak, grooved dorsolaterally, and ending cephalically without spine or corneous tubercle. Suborbital angle very prominent; branchiostegal spine represented by small tubercle. Cervical spine absent. Hepatic and branchiostegal regions with granules. Remainder of carapace punctate dorsally and

granulate laterally. Abdomen subequal in length to carapace, pleura short, subtruncate, rounded caudoventrally. Cephalic section of telson with 2 spines on left (3 right) caudolateral corner. Proximal podomere of uropod with weak distal spine on mesial lobe; mesial ramus of uropod with prominent median rib ending distally in strong distomedian spine not overreaching margin of ramus, laterodistal spine of ramus also strong.

Cephalomedian lobe of epistome (Fig. 4H) short and subtriangular with uniform margins, ventral surface rather flat; main body with shallow fovea; epistomal zygoma arched. Ventral surface of proximal podomere of antennular peduncle with small acute spine at base of distal third. Antennal peduncle without spines; antennal scale (Fig. 4G) 2.5 times as long as broad, broadest slightly proximal to midlength, mesial border forming gentle arc; distal spine strong, reaching distal extremity of antennular peduncle. Mesial half of ventral surface of ischium of third maxilliped studded with irregular rows of long, stiff setae; submarginal lateral row on podomere consisting of much smaller flexible ones; distolateral angle not acute.

Length of right chela (Fig. 4L) 78.9% that of carapace; width 46.3% of length; palm length 37.0% of chela length; dactyl length 1.6 times palm length. Dorsomesial $\frac{1}{4}$ surface of palm studded with tubercles, mesialmost row composed of 6 (left 7) tubercles, dorsolateral half punctate, punctations deep and large in vicinity of dorsolateral base of fixed finger; lateral surface of palm and fixed finger subcostate; ventral surface of palm punctate, with small corneous tubercle on articular rim opposite base of dactyl; no subpalmar tubercle (Fig. 1D). Both fingers of chela with well defined submedian ridges dorsally and ventrally; opposable margin of fixed finger with row of 6 tubercles (fourth from base enlarged) along proximal $\frac{2}{3}$ of finger and additional large one on lower level at base of distal fourth. Opposable

margin of dactyl with row of 9 tubercles, (first and fourth from base larger) along proximal $\frac{4}{5}$; single row of minute denticles extending distally from fifth (sixth on left) tubercle; mesial surface of dactyl with row of 4 adpressed tubercles (7 left) basally giving way to punctations distally. Dorsomedian longitudinal ridges on both fingers well developed. Moderate dorsolateral impression at base of fixed finger.

Carpus of cheliped (Fig. 4L) with distinct furrow dorsally; dorsomesial surface with row of 8 (left 7) low tubercles; dorsolateral surface with sparse punctations; mesial surface with 1 large spiniform tubercle and 3 additional small ones; ventral surface with 1 spiniform tubercle on distal articular rim. Merus with 2 premarginal tubercles dorsally, ventrolateral row of 4 (2 reduced on left) tubercles, and ventromesial row of 12 (11 left); podomere otherwise smooth. Ventral ridge of ischium with 4 small tubercles. Ischium of third pereopod (Fig. 4K) with simple hook extending proximally over basioischial articulation, not opposed by tubercles on basis. Coxa of fourth pereopod (Fig. 4K) with vertically disposed caudomesial boss; that of fifth pereopod (Fig. 4K) lacking boss, its ventral membrane bearing oblique row of small sclerites armed with stiff setae.

First pleopods contiguous at base (Fig. 4D), reaching coxa of third pereopod; central projection (Fig. 4B, F) short, not tapering, lacking subapical notch, rounded apically, and not extending beyond mesial process; mesial process conical, tapering, and directed essentially caudolaterally. Both terminal elements bent caudally at angle slightly greater than 90° ; caudal knob absent.

Allotype female.—Excluding secondary sexual characteristics, differing from holotype in following respects: areola length 42.1% of total length of carapace; cephalo-median lobe of epistome with thickened margins; antennal scale 2.8 times as long as broad; right chela 71.5% of carapace length; opposable margin of dactyl with row of 8

tubercles (7 left), only first tubercle enlarged; mesial surface of dactyl with 7 (6 left) squamous tubercles; merus with 4 (3 left) premarginal tubercles dorsally, ventrolateral row of 3 tubercles, and ventromesial row of 11.

Annulus ventralis (Fig. 4I) deeply embedded in V-shaped sternum, subcircular in outline, with narrow median longitudinal furrow in cephalic half ending in central depression; tongue extending caudosinistrally across caudal side of depression, disappearing beneath thickened caudosinistral wall; sinus reverse S-shaped and tilted sinistrally at almost 90° ending under caudal wall slightly dextral to median line. Postannular sclerite oval. First pleopod reaching mid-length of annulus when abdomen flexed.

Morphotypic male, Form II.—Differing from holotype in following respects: areola length 41.6% of carapace length; antennal scale 2.8 times as long as broad; right chela 68.6% of carapace length; palm length 33.0% of chela length; opposable margin of right fixed finger without enlarged tubercle (third enlarged on left); tip of right fixed finger slightly damaged; opposable margin of dactyl with first and second tubercles enlarged (third on left); merus with 3 premarginal tubercles dorsally, ventrolateral row of 10 tubercles and ventromesial row of 9; central projection of first pleopod (Fig. 4C, E) non-corneous and blunt.

Type locality.—A roadside ditch on the property of the Union Elementary School at the intersection of State Route (St Rte) 79 and County Road (Co Rd) 18, Section 22, Perry Township, Coshocton County, Ohio, (2.1 air km NW of West Carlisle; 5.6 air km SSE of New Guilford), [$40^\circ 12' 45''$ N, $82^\circ 07' 50''$ W]. The specimens were dug from burrows without chimneys in a ditch having permanently flowing water from a spring. The surrounding vegetation was grass (a lawn). The collection was made on 12 July 1989 and consisted of 8 ♂II and 10 ♀. Some of the males were kept alive in the laboratory until they molted which occurred be-

tween 11–17 September. The growth increments (carapace length) were 0.8 to 1.0 mm per individual.

Disposition of the types.—The holotype, allotype, and morphotype are in the collection of the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM 260068, 260069, and 260070, respectively). Paratypes (7 ♂I and 9 ♀) are in The Ohio State University at Newark Crayfish Museum. Specimens from localities other than the type locality are excluded from the type series.

Range and specimens examined.—I have examined 434 specimens of which 91 were (Form 1) males, 133 were (Form 2) males, and 210 were females, from 151 localities. Since the number of collections is large, only one collection from each county is cited. The entire list, however, may be obtained from the author or The Ohio State University at Newark library. Most of the collections were made in roadside ditches and seeps. Unless stated otherwise, the collectors were R. F. Jezerinac (RFJ) and G. W. Stocker (GWS)—Coll 1, RFJ, GWS, and D. Chrisman (DC)—Coll 2, and RFJ, GWS, and T. Jones (TJ)—Coll 3.

KENTUCKY—Bell Co: Fourth intersection (inters) E of 15th Street in Middlesboro, 1 Apr 1986, Coll 1, 3 ♀. Boone Co: St Rte 20, 0.3 km (0.2 mi) W of Interstate (I) 275, 19 Mar 1987, Coll 1, 1 ♀. Boyd Co: St Rte 757, 3.2 km (2.0 mi) W of Whites Creek Road (Rd), 1 Sep 1986, Coll 1, Dave Hile (DH), 2 ♀. Carter Co: St Rte 1, 0.8 km (0.5 mi) S of County (Co) Rd 1496, 1 Sep 1986, Coll 1, DH, 3 ♀. Estill Co: Inters St Rte 52 and Co Rd 1, 2 Apr 1986, Coll 1, 3 ♀. Grant Co: St Rte 22, 1.0 km (0.6 mi) W of Co Rd 36, 16 May 1989, RFJ, 1 ♂I, 1 ♀. Greenup Co: St Rte 1, 0.2 km (0.1 mi) S of Co Rd 1459, 6 Aug 1984, Coll 1, 1 ♂II, 1 ♀. Knox Co: G. R. Hampton Elementary School, St Rte 11 in Barborville, 1 Apr 1986, Coll 1, 4 ♂I, 8 ♀. Laurel Co: Sublimity Elementary School in London, 2 Apr 1986, Coll 1, 1 ♀. Lawrence Co: Roe Creek Rd just W of Unit-

ed States Route (U.S. Rte) 23, 1 Sep 1986, Coll 1, DH, 1 ♂II, 1 ♀. Morgan Co: Inters U.S. Rte 460 and Co Rd 1000, 16 Apr 1988, Coll 1, M. Allen, 3 ♀. Oldham Co: Pattons Creek Rd, 3.2 km (2.0 mi) W of U.S. Rte 42, 19 Apr 1980, RFJ, J. Thoma, M. McCluskey (MM), 2 ♀—2 ♀ ovig. Powell Co: Inters Main Street and Wells Street in Clay City, 2 Apr 1986, Coll 1, 1 ♀. Taylor Co: St Rte 70, 1.6 km (1.0 mi) SW of St Rte 337, 25 Mar 1987, Coll 1, 1 ♀. Whitley Co: Inters St Rte 1277 and U.S. Rte 25W, 25 Mar 1985, Coll 1, 1 ♀.

OHIO—Adams Co: St Rte 41, 0.2 km (0.1 mi) N of Township (Twp) Rd 125, 13 Jun 1983, Coll 1, 3 ♂II, 3 ♀. Carroll Co: Co Rd 20, 1.6 km (1.0 mi) N of St Rte 542, 2 Jun 1984, Coll 1, D. M. Williams (DMW), 1 ♂I. Clinton Co: Inters St Rte 380 and Twp Rd 260, 12 Oct 1985, Coll 2, 1 ♀. Coshocton Co: Type Locality, 12 Jul 1987, Coll 1, R. F. Thoma, N. Gillombardo, Z. Thoma, 8 ♂II, 10 ♀. Crawford Co: Co Rd 12, 1.6 km (1.0 mi) NE of Twp Rd 117, 18 May 1984, Coll 1, 1 ♂I, 1 ♀—ovig. Erie Co: E edge of Crystal Rock, 22 Aug 1976, J. Norrocky, 1 ♀. Fairfield Co: Co Rd 69, 0.8 km (0.5 mi) N of Revenge, 1 Aug 1982, MM, RFJ, 1 ♀. Franklin Co: Twp Rd 5, 0.3 km (0.2 mi) E of Co Rd 107, 1 Mar 1983, D. Rice (DR), G. Phiney (GP), 1 ♂I. Gallia Co: Co Rd 50 1.6 km (1.0 mi) NW of St Rte 790, 8 Jun 1984, Coll 2, 2 ♀—1 ♀ with young. Greene Co: Co Rd 22, 1.6 km (1.0 mi) S of St Rte 35, 12 May 1984, Coll 1, 3 ♂I, 1 ♂II, 1 ♀—ovig. Hardin Co: Co Rd 22, 0.2 km (0.1 mi) E of Ramshorn Rd, 14 Apr 1985, Coll 1, R. J. Jezerinac, 1 ♂I. Highland Co: Twp Rd 124, 0.8 km (0.5 mi) S of St Rte 506, 31 Mar 1984, Coll 1, DMW, 1 ♂I, 1 ♀. Hocking Co: Co Rd 11, 0.5 km (0.3 mi) E of Twp Rd 237, 23 Jun 1984, V. Stocker (VS), GWS, 1 ♂II. Huron Co: Co Rd 167, 0.8 km (0.5 mi) W of St Rte 60, 8 Aug 1982, RFJ, 1 ♀. Jackson Co: St Rte 93, 0.3 km (0.2 mi) S of Co Rd 36, 1 May 1983, Coll 1, RFT, 1 ♂I, 1 ♂II, 3 ♀. Lawrence Co: Co Rd 5, 0.3 km (0.2 mi) S of Twp Rd 198, 20 Apr 1986,

Coll 2, 1 ♂II, 2 ♀, 1 ♀—ovig. Licking Co: St Rte 586, 2.4 km (1.5 mi) NW of St Rte 16, 19 Mar 1983, RFT, RFJ, 3 ♂I. Logan Co: Twp Rd 127, 0.2 km (0.1 mi) W of Twp Rd 129, 22 Aug 1982, RFJ, 1 ♂ II, 1 ♀. Mahoning Co: 1.4 km (0.9 mi) NW of Sebring, 7.5 km (4.7 mi) NE of Alliance, 20 Oct 1979, RFT, 1 ♀. Marion Co: St Rte 98, 1.3 km (0.8 mi) S of St Rte 95, 16 May 1982, K. Matesich, RFJ, 1 ♂I. Madison Co: U.S. Rte 42, 0.2 km (0.1 mi) N of Co Rd 145, 10 Jul 1982, RFJ, 1 ♂II. Medina Co: Twp Rd 94, 0.2 km (0.1 mi) W of Co Rd 59, 6 Aug 1982, RFJ, 1 ♀. Meigs Co: St Rte 124, 1.8 km (1.1 mi) E of St Rte 246, 7 Aug 1985, Coll 1, 1 ♂I, 1 ♂II. Monroe Co: St Rte 7 at mile post 5.5, 9 July 1983, GWS, 1 ♀. Morrow Co: Twp Rd 124, 0.8 km (0.5 mi) W of St Rte 61, 28 Apr 1984, J. Frenton, GWS, 2 ♂I. Muskingum Co: St Rte 146, 0.3 km (0.2 mi) W of Chandlersville, 19 May 1985, K. Baker, 1 ♀. Perry Co: St Rte 37, 0.2 km (0.1 mi) E of Co Rd 23, DR, GP, 4 ♂I. Pickaway Co: Co Rd 280, 1.6 km (1.0 mi) E of Twp Rd 60, 2 Oct 1983, Coll 1, 1 ♂I, 2 ♀. Pike Co: Co Rd 65A, 0.3 km (0.2) E of Co Rd 68, 5 May 1984, Coll 1, RFT, 4 ♀. Seneca Co: St Rte 53, 0.8 km (0.5 mi) S of Twp Rd 92, 19 May 1985, Coll 1, 1 ♂I, 1 ♀. Summit Co: Co Rd 253, 11 Aug 1983, Ohio Environmental Protection Agency, 1 ♂II. Tuscarawas Co: Co Rd 69, 2.1 km (1.3 mi) E of St Rte 250, 2 Jun 1984, Coll 1, DMW, 2 ♂I, 3 ♀, 1 ♀—ovig. Vinton Co: St Rte 278, 3.2 km (2.0 mi) N of St Rte 667, 14 Mar 1983, DR, GP, 1 ♂I. Washington Co: St Rte 7, 0.2 km (0.1 mi) E of Co Rd 46, 7 Aug 1985, Coll 1, 1 ♀.

PENNSYLVANIA—Beaver Co: Rd S of Rural Road (RR) 04048, 1 Jul 1985, VS, GWS, 2 ♀. Butler Co: RR 10113, 0.5 km (0.3 mi) S of St Rte 422, 27 Jun 1984, VS, GWS, 1 ♂II. Fayette Co: Inters RR 26022 and St Rte 819, 18 Jun 1984, Coll 1, 1 ♂I, 1 ♂II. Greene Co: RR 3009, 2.1 km (1.3 mi) W of St Rte 19, 26 May 1984, GWS, 1 ♀—ovig. Washington Co: S of I-70 exit, (2.4 air km S of Denningsville), 19 Jul 1984, VS,

GWS, 1 ♀. Westmoreland Co: RR 64015 just N of Twp Line, (3.8 km SE of Milligan), 28 Jun 1984, VS, GWS, 1 ♂II, 4 ♀.

TENNESSEE—Monroe Co: Inters U.S. Rte 128 and St Rte 33 at Monroe-Loudon County Line, 31 Mar 1986, Coll 1, 1 ♂I, 1 ♀. Sevier Co: St Rte 338, 4.8 km (3.0 mi) E of Boyds Creek Rd, 31 Mar 1986, Coll 1, 1 ♂II, 1 ♀.

WEST VIRGINIA—Barbour Co: Arden Rd, 1.3 km (0.8 mi) E of U.S. Rte 119, 8 Apr 1986, Coll 1, 1 ♂I. Braxton Co: U.S. Rte 19, 6.2 km (3.8 mi) E of St Rte 5, 25 May 1985, Coll 2, 1 ♂I. Cabell Co: Guyan Creek Rd, 4.0 km (2.5 mi) NE of St Rte 2, 19 Oct 1985, Coll 2, 1 ♂I. Doddridge Co: St Rte 18, 0.8 km (0.5 mi) S of Co Rd 66, 14 Apr 1986, Coll 1, 2 ♀—1 ♀ ovig. Gilmer Co: Rd to Cedar Run State Park, (2.9 air km SSW of Glenville), 25 May 1985, Coll 2, 1 ♂II, 2 ♀. Harrison Co: St Rte 20, 2.6 km (1.6 mi) E of Dola, 24 Aug 1984, VS, GWS, 1 ♀. Kanawha Co: Inters St Rte 25 and Co Rd 25/13, 9 Apr 1988, GWS, 1 ♀. Lincoln Co: Co Rd 40, 1.6 km (1.0 mi) S of St Rte 3, 21 Jun 1989, Coll 1, 1 ♀. Logan Co: Co Rd 5, 0.8 km (0.5 mi) S of Co Rd 3, 28 Jul 1988, GWS, TJ, 1 ♂I, 1 ♂II. Lewis Co: Inters Co Rd 10 and Co Rd 10/8, 8 Sep 1988, Coll 1, 1 ♀. Marion Co: Inters U.S. Rte 250 and Co Rd 8, 12 Aug 1988, Coll 3, 1 ♂II, 3 ♀. Mason Co: U.S. Rte 33, 0.8 km (0.5 mi) S of Graham Station, 6 Aug 1985, Coll 1, 1 ♂I. Putnam Co: Co Rd 5, 0.6 km (0.4 mi) SW of U.S. Rte 35, 1 Oct 1988, Coll 3, 1 ♀. Ritchie Co: Co Rd 50/34, 1.8 km (1.1 mi) NE of U.S. Rte 50, 17 Jul 1988, Coll 3, 1 ♀. Roane Co: St Rte 27, 2.4 km (1.5 mi) W of St Rte 29, 11 Sep 1988, Coll 3, 1 ♀. Taylor Co: Co Rd 3, 2.4 km (1.5 mi) N of St Rte 76, 11 Aug 1988, Coll 3, 1 ♂II, 1 ♀. Tyler Co: Conaway Run Lake State Park campground, 13 Apr 1986, Coll 1, 1 ♀. Upsur Co: St Rte 20, 1.9 km (1.2 mi) S of St Rte 4, 25 May 1985, Coll 2, 2 ♂II. Wayne Co: U.S. Rte 52, 1.4 km (0.9 mi) W of St Rte 35, 20 Oct 1985, Coll 2, 4 ♂II, 4 ♀. Wood Co: Co Rd 11, 2.9 km (1.8 mi) N of St Rte 68, Coll

Table 2.—Seasonal data of *C. (T.) thomai*, new species.

Month	First form males (number)	Second form males (number)	^a Females (number)	Sex ratio (M:F)	Ovigerous
February		2			
March	26	7	15	(2.2:1)	1
April	19	3	38	(1:1.7)	5
May	10	11	32	(1:1.5)	10
June	7	19	35	(1:1.4)	2
July	2	14	24	(1:1.5)	
August	10	26	34	(1.1:1)	
September	8	7	20	(1:1.3)	
October	3	5	11	(1:1.4)	

^a Numbers include ovigerous females.

1, 1 ♂I. Wyoming Co: St Rte 971, 3.7 km (2.3 mi) SW of St Rte 10, 6 Jul 1988, Coll 1, 1 ♂II, 1 ♀.

Color notes.—In the central portion of the species range, the color pattern is rather uniform and consists of a dark brownish-olive carapace and abdomen. The tips of the fingers, lateral margin of the Chela, and dorsal knob on the chela at the base of the dactyl is orangish to reddish. The rostral margins are cream. The undersurface is cream to white. Red bands are never present on the rim of the articulation joints and caudal margins of the abdominal tergites.

The color patterns at the western and southern periphery of the range is more variable. In southwestern Ohio (Highland County), the carapace tends to be chestnut-brown with the abdomen being darker than the thoracic portion of the carapace. A darker brown band is present on the anterior flank of the cervical groove. The lateral margin of the finger, the palmer tubercles, tubercles on the dorsomesial surface of the merus, and the mesial spine on the merus are orangish. The dorsal knobs on the distal rim of the palm of chela at the base of the dactyl and the knob on the ventral rim are reddish. The undersurface is cream to white. In northern Kentucky and southern West Virginia, the basic body color tends to be emerald green with additional structures

colored like those in southwestern Ohio. Two specimens were collected from Clinton County, Ohio, (one specimen was destroyed) the basic body color of which was speckled emerald green with orange and red as described above. Two individuals, one collected in Medina County, Ohio, and the other from Marion County, West Virginia, were blue, apparently lacking red chromatophores.

Variations.—As expected in a species that occupies a wide geographical area, minor variations occur in most body structures and body proportions. The material was examined for clinal variations and characters that might be restricted to local populations, but none was found. However, those specimens collected in Tennessee tend to have a more deeply excavate rostrum. In this species, there appears to be more variation in color than in body structures. Additional meristic and morphometric data (simple descriptive statistics, ratios, and regression analysis) are available from the author or the library at The Ohio State University at Newark.

Size.—The largest specimen examined was a female with a carapace length of 53.8 mm from Mason County, West Virginia. The largest Form I male measured 51.9 mm and the smallest 26.6 mm. For measurements see Table 1.

Life-history notes.—Ovigerous females were collected on 31 March; 14, 19, and 20 April; 1, 4, 7, 12, 18, and 26 May; and 2 June. Females with young attached were captured on 27 May and 8 and 11 June. Form I males were found from 1 March through 18 June and from 19 July to 19 October. Additional seasonal data are presented in Table 2.

Crayfish associates.—Collected with *C. (T.) thomai* at one or more sites in Ohio were *C. (C.) b. cavatus* Hay (1902), *C. (C.) ortmanni* Williamson (1907), *C. (C.) sciotosensis* Rhoades (1944b), *C. (P.) robustus* Girard (1852). In the other states, its associates included *C. (C.) b. cavatus*, *C. (C.)*

b. carinirostris Hay (1914), *C. (J.) monongalensis* Ortmann (1905a), *C. (J.) dubius* Faxon (1884), *C. (P.) robustus*, and *C. (C.) sciotensis*.

Relationships.—*Cambarus (T.) thomai* is most closely related to *C. (T.) acanthura* but differs from the latter in that the distomedian spine on the mesial ramus of the uropod does not overreach the distal margin of the ramus and the ventral surface of the carpus has a spiniform tubercle on the distal articular rim. Sometimes the spiniform tubercle is observed on *C. (T.) acanthura* but it is never well developed.

Etymology.—I take pleasure in naming this crayfish in honor of Roger Francis Thoma of the Ohio Environmental Protection Agency, a student of crayfishes and a friend.

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